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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

KHOLDEBARIN, IMAN K

ART UNIT PAPER NUMBER

3709

DATE MAILED: 12/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/697,215

Applicant(s)

HAO ET AL.

Examiner

I Kenneth Kholdebarin

Art Unit

3709

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>10/30/2003</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

"Certain embodiments of the present invention provide" needs to be removed.

Correction is required. See MPEP § 608.01(b).

Claim Objections

2. Claim 14 is objected to because of the following informalities:

Claim 14, line 4: "said waveforms for a plurality of" should be -- said waveforms for the plurality of --.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1, 2, 3, 7, 9, 10, 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Chiao '869. (US Patent 5,984,869)

Re Claim 1 and 2: Chiao discloses a coded excitation of ultrasound beams, encoding a first ultrasound beam (here one of the two sequences of pulses in disclosed reference) with a first code, transmitting first ultrasound beam on a first path (path that used for transmitting the pulses) encoding a second ultrasound beam (here the second sequences of pulses which is disclosed in reference) with a second code transmitting second ultrasound beam on a second path and receiving echo signals (received signal according to the reference) from first and second ultrasound beams, wherein first and second codes are Golay codes (See Fig.2, col. 2, line 58-67).

Re Claim 3: Chiao discloses a method wherein first path and second path (Path used to transmit the pulses) comprise adjacent scan lines (See Fig.1, col.1 line 25-30 and 54-60).

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Re Claim 7: Chiao discloses the first and second ultrasound beams are encoded in first and second transmit focal zones and transmitted on said first path / direction and second path are equal (See Fig.3, col.2 line 35-37 and 25-30).

Re Claim 9 and 10: Chiao discloses a method for single transmission coded excitation where encoding a plurality of signals with a plurality of a complimentary codes and transmitting plurality of signals on a plurality of paths and processing echo (here Kronecker delta function) signals produced from plurality of signals (See Fig.3, Col. 7 line 10-26).

Re claim 11: Chiao discloses a method for filtering echo signals (See Col.5 line 25-45).

5. Claim 14-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Chiao '618 (US Patent 6,375,618).

Re Claim 14: Chiao '618 discloses a system for transmitting coded ultrasound signals wherein a waveform generator (24) for generating waveforms for a plurality of ultrasound signals and waveforms generator encodes waveforms for the plurality of ultrasounds signals; a transducer (10) for transmitting ultrasound beams based on said waveforms along a plurality of beam paths, transducer capable of receiving echo signals in response to ultrasound beams and decoder (52) for converting echo signals to image data (See fig. 2 and 8; Col. 8, line 45-50; Col. 4, line 19-21, Col 4, line 46-50).

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Re Claim 15 and 16: Chiao '618 discloses the waveform generator encodes plurality of ultrasound signals with complimentary Golay codes (Fig. 1, Col. 8, line 25-26).

Re Claim 17: Chiao '618 discloses a system the decoder comprises a matched filter (46) / pulse compression, for filtering echo signals (See Fig. 7, Col. 7 line 65-66 and Col. 8, line 1-3).

Re Claim 18: Chiao '618 discloses a system wherein the decoder at least one of a lateral averaging filter and a finite impulse response filter (50) (See Col. 8, line 31-32).

Re Claim 19 and 20: Chiao '618 discloses a system with a beamformer / beamsummer (44) and beamformer memory (42) for forming ultrasound beams from waveforms, where multi-line beamformer, receives a plurality of echo signals (here is the received sequence pulses) in response to an ultrasounds signal (See Col. 7, line 10-11).

Re Claim 21: Chiao '618 discloses a system with a memory (42) capable of storing at least one of waveforms and echo signals (See Fig. 2, Col 5, line 5-7).

Re Claim 22: Chiao discloses a system with a controller (20) for controlling an imaging mode and parameters of system (See Fig. 1, Col. 5, line 13-16)

Re Claim 23: Chiao discloses a system with a waveform generator (44) encodes first and second ultrasound beams (the two sequence pulse) with first and second complimentary Golay codes,

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(Col. 8, line 25-28) and transducer transmits first and second ultrasound beams in first and second focal zone along a beam path, and decoder (52) match filters / pulse compression, echo signals received in response to first and second ultrasound beams and averages echo signals between first and second focal zones. (See Fig 2, Col. 8 line 1-3)

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 4, 8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiao '869 in view of Philips (US patent 6,213,947). The teachings of Chiao '869 have been discussed above.

However, Chiao '869 fails to disclose or fairly suggest use of matched filtering on the echo signals.

Philips teaches the use of match filtering for most of the discussions related to both tissue harmonic imaging and contrast agent imaging within the art (See col.26 line 17-25).

Therefore, in view of Philips, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the match filter with the filter of Chiao in '869. Match

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filter could be used on echo signals in contrast agent imaging to have concentration on preferred embodiments of the received harmonic pulse(s) and further to apply the lateral filtering for averaging between the first and second transmit focal zone, in order to significantly reduce the signal to noise ratio of a beam in an ultrasound imaging method.

8. Claim 5, 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiao ('869).

The teaching of Chiao '869 has been discussed above.

Although Chiao '869 fails to disclose or fairly suggest use of lateral filtering on the echo signals, Chiao '869 teaches a method wherein finite impulse response (FIR) was applied for filtering (See Col.5 line 31-36), therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the method of averaging the echo signals and higher order finite impulse response (FIR), by lateral filtering, in order to improve the method and apparatus of ultrasounds imagining wherein the signal to noise ratio (SNR) is reduced.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicants disclosure. Chiao ('6,328) discloses the method and apparatus for ultrasonic beam forming using Golay-coded excitation; Bae discloses ultrasound imaging method and apparatus using orthogonal Golay codes; Chiao discloses method and apparatus using coded excitation in ultrasonic perfusion imaging ('8,328) Clark discloses data acquisition in ultrasonic imaging systems using multiple, parallel receive and transmit lines; Hwang discloses high frame rate pulse inversion harmonic ultrasonic diagnostic imaging system; Jeong discloses ultrasound imaging system and method based on simultaneous multiple transmit-focusing using weighted orthogonal chirp signals.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to I. Kenneth Kholdebarin whose telephone number is 571-270-1347. The examiner can normally be reached on 8 am to 4 pm Monday thru Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jong-Suk (James) Lee can be reached on 571-270-1341. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

IKK

November 11, 2006



JONG SUK LEE
SUPERVISORY PATENT EXAMINER